

hydroquinone mono-methyl ether were mixed, with which 77.68 parts by weight of silane-treated silica powder of less than 1  $\mu$ m was mixed to form a paste.

Package B (paste): 5 parts by weight of triethylene glycol dimethacrylate, 10 parts by weight of triethylol propane trimethacrylate, respectively 0.3 and 0.02 parts by weight of dimethyl-p-toluidine and hydroquinone mono-methyl ether were mixed, with which 84.68 parts by weight of silane-treated silica powder of less than 1  $\mu$ m was mixed to form a paste.

Packages A and B were mixed in the ratio of 50:50 and stirred for one minute to be cured. The physical properties obtained are shown in Table 1.

#### Referential Example 1

A composite resin was mixed with 70 parts by weight of the conventional bisphenol-A diglycidyl dimethacrylate and 30 parts by weight of triethylene glycol dimethacrylate together with 0.3 part by weight of benzoyl peroxide and polymerized in the same way as in Example 1. The physical properties obtained are also shown in Table 1 for comparison.

#### Referential Example 2

Physical properties of the commercial composite resin were measured. The results are shown in Table 1.

In terms of the composition, Example 2 corresponds to referential Example 1 and Example 3 corresponds to referential Example 2, to compare the physical properties of the phosphazene compound according to the present invention with those of commercial composite resin in Table 1.

#### Measurement of Physical properties

(1) Polymerization shrinkage was measured by specific gravity method.

(2) Compressive strength (of specimens, 4 $\phi$ ×5 mm) was measured by Instron (2 mm/minute in cross head speed).

(3) Flexural strength (of specimens, 25×2×2 mm) was measured in accordance with ISO 4049 (20 mm in the distance between supports, and 1 mm/minute in cross head speed).

(4) Hardness was measured by Knoop hardness tester with 100 g load.

(5) Thermal expansion coefficient (of specimens, 5 $\phi$ ×20 mm) was measured by the thermal expansion tester (1° C./2 minutes in the temperature-rising rate, from 30° C. to 80° C.).

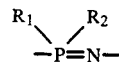
(6) Water absorption was measured by immersing specimens of 9 $\phi$ ×15 mm in distilled water at 37° C. and determining the weight increase, expressed in % relative to the initial weight.

TABLE 1

Physical properties of the dental filling composite materials												
Standard Deviation in parenthesis												
Physical Properties												
Example No.		Polymerization Shrinkage (%)		Compressive Strength (kg/cm <sup>2</sup> )		Flexural Strength (kg/cm <sup>2</sup> )		Hardness (Knoop)		Thermal Expansion Coefficient (× 10 <sup>-6</sup> /°C.)		Waters Absorption (7 days %)
Example	1	7.0	(0.1)	3.468	(287)	1.210	(110)	39	(1.3)	46.5	(3.1)	2.01
	2	7.4	(0.2)	3.710	(152)	1.260	(131)	30	(1.9)	56.8	(6.3)	1.92
	3	—	—	4.220	(301)	1.593	(162)	64	(2.6)	30.1	(2.4)	0.06
Referential Example	1	8.0	(0.2)	1.706	(125)	1.320	(106)	21	(1.0)	94.1	(8.1)	2.11
	2	—	—	3.480	(274)	1.240	(121)	51	(2.1)	41.0	(6.1)	0.08

What is claimed is:

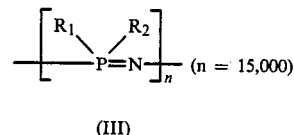
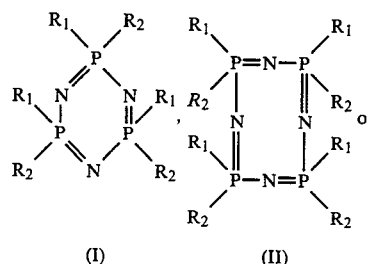
1. A dental cavity filling composite material comprising: the copolymerization reaction product of a phosphazene monomer having the formula:



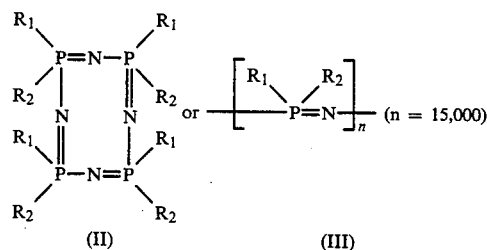
in which at least one of  $R_1$  and  $R_2$  is a polymerizable radical having not less than 3 carbon atoms, a copolymerizable monomer selected from the group consisting of acrylic acid, esters of acrylic acid, methacrylic acid, esters of methacrylic acid and mixtures thereof and

a polyfunctional copolymerizable monomer selected from the group consisting of triethylene glycol dimethacrylate, bisphenol-A diglycidyl glycol dimethacrylate, trimethylol propane trimethacrylate, tetramethylol methane tetraacrylate and mixtures thereof.

2. A filling composite material according to claim 1, wherein the phosphazene has the formula:



3. The filling composite material of claim 2, wherein the phosphazene has the formula:



4. The filling composite material of claim 1 further comprising a filler.

\* \* \* \* \*